



U.S. Department of Energy Office of Environmental Management Depleted Uranium Hexafluoride Management Program



Transportation of Depleted Uranium Materials in Support of the Depleted Uranium Hexafluoride Conversion Program

The conversion program will require the shipment of depleted uranium hexafluoride (DUF_6) cylinders to one or both of the conversion plants. The preferred alternative assumes that all DUF_6 cylinders currently stored at the East Tennessee Technology Park (ETTP) near Oak Ridge, Tennessee, would be shipped to the Portsmouth, Ohio, site for conversion by December 31, 2009. Following conversion of the DUF_6 to a more stable chemical form (such as uranium oxide), current plans call for the depleted uranium conversion product to be used, or, if uses are not identified, disposed of. The packaging and transportation of the conversion products will be the responsibility of the selected conversion contractor. The safe transportation of DUF_6 cylinders and of the depleted uranium conversion products following conversion will be a vital component of the conversion program. This fact sheet provides a brief overview of the issues associated with the transportation of these materials.

Shipment of Radioactive Materials

Under the Department of Transportation Act of 1966, the U.S. Department of Transportation (DOT) has regulatory responsibility for safety in transportation of all hazardous materials, including radioactive material. DOT developed a single set of safety standards that assured that properly prepared shipments of hazardous materials would be acceptable for transport by all modes (rail, highway, air, and water). These standards are set forth primarily in DOT's Hazardous Materials Regulations located in 49 *Code of Federal Regulations* (CFR) Parts 100 - 178.

Under the Atomic Energy Act of 1954, as amended, the U.S. Nuclear Regulatory Commission (NRC) also has responsibility for safety in the transport of radioactive materials. Because of the overlap in statutory authorities of the NRC and DOT, the two agencies have a Memorandum of Understanding (MOU) with regard to regulation of the transport of radioactive material. Consistent with the MOU, the NRC has promulgated, in 10 CFR Part 71, shipping requirements for radioactive materials.

The primary regulatory approach used by DOT and NRC for ensuring safety during transportation of radioactive materials is by specifying standards for the proper packaging of such materials. Packaging for transporting radioactive materials must be designed, constructed, and maintained to ensure that it will contain and shield the contents during normal transportation. The type of packaging used is determined by the radioactive hazard associated with the packaged material. The hazard is determined by the characteristics of the specific radioactive material and its physical form (e.g., solid, liquid, or gas). The regulations also specify many requirements for labeling, marking, training, and administrative controls.

The shipment of radioactive materials may take place by truck, rail, or barge. Federal regulations do not place route restrictions on the movement of DUF_6 cylinders or depleted uranium on United States highways or railroads.

It should be noted that the nuclear properties of depleted uranium are such that the occurrence of a nuclear criticality (i.e., a nuclear chain reaction) is not a concern, regardless of the amount of depleted uranium present.

Shipment of DUF₆ Cylinders

DUF₆ has been transported safely for more than 40 years. Specific requirements exist for the shipment of DUF₆ cylinders. Among other things, DUF₆ cylinders must be designed, fabricated, inspected, tested, and marked in accordance with the version of American National Standard N14.1, “Uranium Hexafluoride – Packaging for Transport” that was in effect at the time the cylinder was manufactured. Although a detailed discussion of DUF₆ transportation regulations is not included here, three requirements are particularly important relative to DUF₆ cylinder shipments: (1) cylinders must be filled to less than 62% of the certified volumetric capacity; (2) the pressure within cylinders must be less than 14.8 pounds per square inch; and (3) cylinders must be free of cracks, excessive distortion, bent or broken valves or plugs, and broken or torn stiffening rings or skirts, and must not have shell thicknesses that have decreased below a specified minimum value. Cylinders not meeting these requirements are often referred to as substandard or noncompliant.

Although the exact number is not yet known, preliminary reports suggest that many of the cylinders at ETTP will not meet the DOT transportation requirements. Three options exist for shipping these noncompliant cylinders:

- The DUF₆ contents could be transferred from noncompliant cylinders into new or compliant cylinders.
- An exemption could be obtained from the DOT, allowing the DUF₆ cylinders to be transported either “as is” or following repairs. The primary finding that DOT must make to justify granting an exemption is that the proposed alternative will achieve a level of safety that either (1) is at least equal to the level of safety required by the otherwise applicable regulation; or, (2) if the otherwise applicable regulations do not establish a required level of safety, is consistent with the public interest and will adequately protect against the risks to life and property inherent in the transportation of hazardous materials in commerce.
- Noncompliant cylinders could be shipped in an “overpack.” In this case, the shipper would have to obtain an exemption from DOT allowing the existing cylinder, regardless of its condition, to be transported if it is placed into a metal overpack. The metal overpack would have to be specially designed. Furthermore, DOT would have to determine that, if the overpack is fabricated, inspected, and marked according to its design, the resulting packaging (including the cylinder and the overpack) would have a level of safety at least equal to the level of safety required for a new DUF₆ cylinder.

The selected conversion contractor will be required to provide to the U.S. Department of Energy a transportation plan that describes in detail the approach or approaches that will be used to ship the ETTP cylinders. The plan is due 6 months after the award of the conversion contract.

Shipment of Depleted Uranium Conversion Products

The category of industrial package required for transport of a radiological material is related to the potential radiological hazard of the material. In general, content posing greater radiological risk must be transported in a more durable package. Because of their relatively low concentration of radioactivity, the depleted uranium conversion products can be shipped using standard industrial packaging.

Evaluation of Transportation Risks

The EIS for the conversion project will include a detailed evaluation of the risks associated with the transportation of the depleted uranium materials. This assessment will evaluate the risks to both workers and members of the public during normal transportation conditions and hypothetical accidents.

In 1995, DOT published a final rule which added a new "Industrial Packaging" (IP) category of packaging to the Hazardous Materials Regulations. Three categories of IPs were established (IP-1, IP-2, and IP-3) for use in certain shipments of low specific activity (LSA) materials. An IP-1 package must meet the general design requirements now specified in 49 CFR 173 Subparts A and B and in 49 CFR 173.410. Except for this specific requirement, IP-1 packaging is essentially equivalent to the "strong tight packaging" formerly approved in 49 CFR for LSA materials. Strong tight packaging has no performance specifications. Its only requirement is to meet the general design requirements in 40 CFR 173.410 and 173.24. NOTE: Strong tight packaging is still authorized by 49 CFR 173.427 for exclusive-use shipments of certain LSA materials.

For More Information

Please direct comments or questions concerning the DOE DUF₆ Management Program to:
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Environmental and project-related materials are available for public review in the following reading
rooms:

DOE Headquarters, Freedom of Information Reading Room, 1000 Independence Avenue,
S.W., Room 1 E-190, Washington, DC 20585. Telephone: (202) 586-3142.

Oak Ridge/DOE, Public Reading Room, 230 Warehouse Road, Suite 300, Oak Ridge,
Tennessee 37831. Telephone: (865) 241-4780 or 1-800-382-6938, option 6.

Paducah/DOE, Environmental Information Center, 115 Memorial Drive, Paducah, Kentucky
42001. Telephone: (270) 554-6967.

Portsmouth/DOE, Environmental Information Center, 3930 U.S. Route 23, Perimeter Road,
Piketon, Ohio 45661. Telephone: (740) 289-3317.

Additional information is also available through the project web site at: <http://web.ead.anl.gov/uranium>,
or at <http://www.tis.eh.doe.gov/nepa>.